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NOTICE OF MEETING AND CALL FOR ABSTRACTS

# 27TH PLANT DEVELOPMENT WORKSHOP

## SATURDAY, APRIL ~~18~~ 11 1992

## INSTITUT DE RECHERCHE EN BIOLOGIE VÉGÉTALE UNIVERSITÉ DE MONTRÉAL ET JARDIN BOTANIQUE DE MONTRÉAL

Hosted by Dr. Luc Brouillet (Université de Montréal)
and
Mr. Denis Barabé (Jardin botanique)

**Preliminary Program:**

Registration ..... 8:30 à 9:00 am
Contributed papers ..... 9:00 à 12:00
Lunch and Poster ..... 12:00 à 13:00
Contributed papers ..... 14:00 à 15:00
Keynote address by Dr. Rolf Sattler (McGill) ..... 15:00 à 16:00
Reception ..... 16:00

**Please note the abstract form enclosed:** Return the form no later than March 7th. Please note whether you are giving an oral or poster presentation.

Please let us know the number of people form your labo who will be attending and how many intend to stay for the reception at 16:00.

**Address all correspondence to:**

Dr. Luc Brouillet
or
Mr. Denis Barabé
Institut de recherche en biologie végétale
4101 est rue Sherbrooke
Montréal (Québec)
H1X 2B2

FAX: (514) 872-9406

Further details about conference rooms and other information will be mailed as soon as an estimate of the number of attendees is available.

ABSTRACT FORM

# 27TH PLANT DEVELOPMENT WORKSHOP
# INSTITUT DE RECHERCHE EN BIOLOGIE VÉGÉTALE
# APRIL 18, 1992

THIS FORM MUST BE RECEIVED BY MARCH 7, 1992

MAIL TO: DR. LUC BROUILLET
OR
MR. DENIS BARABÉ

DO NOT OVERLAP THE FRAME

POSTER: ❑

ORAL: ❑

NUMBER OF PEOPLE WHO WILL ATTEND: _____

(27)

# 27th PLANT DEVELOPMENT WORKSHOP

Institut de recherche en biologie végétale

Jardin botanique de Montréal

11 avril 1992

# NOTE THE MODIFICATION IN THE PROGRAM:

## 11:30 - 11:50 Barabé et al., Oral presentation

**27TH PLANT DEVELOPMENT WORKSHOP**
**INSTITUT DE RECHERCHE EN BIOLOGIE VÉGÉTALE**
**JARDIN BOTANIQUE DE MONTRÉAL**
**APRIL 11, 1992**

## PROGRAM

Oral presentations (Salle Léon-Provancher)

08:45-09:20 Registration, poster set-up, Main Bulding, Jardin botanique.

09:20-09:30 Opening welcome.

09:30-09:50 E. Mellerowicz, R.T. Riding (UNB, Biology) and C.H.A. Little (Forestry Canada - Maritimes Region). - Cambial response to IAA is positively correlated to nucleolar activity in balsam fir.

09:50-10:10 A.M. Keightley and A.M. Zobel. Chemistry Dept., Trent University, Peterborough, Ontario, K9J 7B8. - Furanocoumarins as autoinhibitors of germination.

10:10-10:30 C.A. Telmer, W. Newcomb and D.H. Simmonds*. Department of Biology, Queen's University, Kingston, Ontario, K7L 3N6. *Plant Research Centre, Agriculture Canada, Ottawa, Ontario, K1A 0C6. - Embryogenesis from isolated microspores of *Brassica napus*.

10:30-10:50 Coffee

10:50-11:10 C.L. Pottruff* and U. Posluszny. Department of Botany, University of Guelph, Guelph, Ontario, N1G 2W1. - Developmental morphology of reproductive structures of *Phyllospadix* (*Zosteraceae*).

11:10-11:30 J.R. Kemp*, U. Posluszny and P.G. Kevan. Department of Botany, University of Guelph, Guelph, Ontario, N1G 2W1. - Floral development of *Rosa setigera* (Michaux).

11:30-11:50 D. Barabé, S. Daigle et L. Brouillet. Institut de Recherche en Biologie Végétale, Jardin botanique de Montréal, 4101 est, rue Sherbrooke, Montréal, Québec, H1X 2B2. - Sur la croissance allométrique de la feuille des *Begonia*.

11:50-13:45 Lunch (Cafeteria of the Garden, and visit of particular collections for those who are interested).

13:45-14:30 Poster session.

14:30-14:50 C.M. Kampny*, T.A. Dickinson and N.G. Dengler. Department of Botany, University of Toronto, ON M5S 3B2 and Department of Botany, Royal Ontario Museum, Toronto, Ontario, M5S 2C6. - Bud growth in *Veronica longifolia (Scrophulariaceae)*.

14:50-15:10 J. Vieth, G. Laublin, C. Morrissette et M. Cappadocia, IRBV, Montréal. Aspects histologiques de l'embryogenèse somatique indirecte chez Iris à partir d'explantats de racines.

15:10-16:00 Invited speaker
R. Sattler. Biology Department, McGill University, Montréal, Québec, H3A 1B1. - What is a leaf? Reflections on the conceptual basis of comparative developmental morphology.

16:00-17:00 Reception (wine and cheese; room 318).

## Posters

C. Gervais[1], D. H. Simmonds[1] and W. Newcomb[2]. [1]Plant Research Centre, Agriculture Canada, Ottawa, Ontario, K1A 0C6. [2]Department of Biology, Queen's University, Kingston, Ontario, K7L 3N6. - The role of F-Actin in pollen development of *Brassica napus* cv. topas.

M.S. Lamhamedi and J.A. Fortin. Institut de Recherche en Biologie Végétale. 4101, est rue Sherbrooke, Montréal, Québec, H1X 2B2. - The architecture of the extramatrical phase of *Pisolithus* sp. and water relations of *Pinus pinaster* seedlings during water stress.

G. Laublin[1], M. Brault[1], S. Daigle[1,2] et M. Cappadocia[1]. [1]Institut de Recherche en Biologie Végétale, 4101 est, rue Sherbrooke, Montréal, Québec, H1X 2B2. [2]Jardin botanique de Montréal. - La culture d'ovaires d'*Iris* sp.

M.M. West, J.N.A. Lott and D.R. Murray, Department of Biology, McMaster University, Hamilton, Ontario, Canada; University of Sydney, Sydney, Australia, 1992. - Studies of storage reserves in seeds of the marine angiosperm *Zostera capricorni*.

A.M. Zobel[1], M. Kuras[2], S.A. Brown[1], T. Tykarska[2] and E. Schnug[3]. [1]Chemistry Dept., Trent University, Peterborough, Ontario, K9J 7B8; [2]Electron Microscopy, Warsay University, Poland; [3]Institute for Plant Nutrition and Soil Science, Christian-Albrechts University, D-2300 Kiel, Germany. - Cell structure changes and secondary metabolite extrusion during senescence.

E.Mellerowicz, R.T.Riding (UNB, Biology) and C.H.A. Little (Forestry Canada - Maritimes Region). - Cambial response to IAA is positively correlated to nucleolar activity in balsam fir.

The ability of the 1-year old vascular cambium to respond to IAA varies during the dormancy stages of rest and quiescence and the subsequent period of activity. It is minimal in early fall (rest), increases to a high level in late fall (rest-quiescence transition), remains high during winter (quiescence), peaks right before reactivation and declines to a low level shortly after cambial activity is resumed. To determine if this variation in ability to respond to IAA reflects the overall capacity for protein synthesis the number and volume of nucleoli were measured and $^{3}$H-uridine incorporation into nuclei was monitored. The number of nucleoli per nucleus increased from 4.2 to 5.5 concomitantly with the onset of dormancy until December and this high level was maintained throughout the quiescent period. Immediately after reactivation, the nucleoli number declined to a 4.2 in May. The total nucleolar volume per nucleus followed a different pattern of change. It reached minimum at the onset of dormancy (rest), increased 1.5 times during the rest-quiescence transition and 7-fold at the time of cambial reactivation, then decreased to a low level in June. The incorporation of $^{3}$H-uridine into nuclei was greatest during the rest-quiescence transition and it was always more intense in nucleoli than outside. These observations support the hypotheses that cambial cells 1) accumulate ribosomes, and possibly mRNA, for use during spring reactivation, 2),organize sites for ribosome synthesis possibly using amplified rDNA during early part of dormancy and 3) that the resulting increased potential for protein synthesis allows the cambium to respond to IAA.

Furanocoumarins as autoinhibitors of germination

Angela M. Keightley and Alicja M. Zobel Chemistry Dept., Trent University, Peterborough, ON K9J 7B8

Furanocoumarins were found on seeds of Rutaceae and on fruits of Umbelliferae (Zobel and Brown, 1991) in substantial concentrations, as well as within the tissue. Using an autofluorescence microscope, we found differences in intensity of emitted light from different compartments of a seed or a fruit: surface, fruit tissue, seed surface, seed tissue, embryo surface and embryo tissue. Isolation of tissues confirmed differences in concentration in various parts of seed and fruit. High concentrations in any of these compartments could be responsible for autoinhibition of germination if coumarins were in contact with embryo cells (e.g., in a wet environment), because we have found that coumarins inhibit mitosis. During several months of successive imbibitions, when water was continually replaced, the removed samples contained decreasing concentrations of these compounds. We suggest that, in nature, a similar scenario exists: during winter and spring thaws, water slowly removes germination-inhibiting compounds, and in this way, by renewing mitosis, allows the embryo to protrude from the seed coat.

Zobel, A.M. and Brown, S.A., 1991. Psoralens on the surface of seeds of Rutaceae and fruits of Umbelliferae and Leguminosae. Can. J. Bot. 69:485-8.

Zobel, A.M. and Brown, S.A., 1991. Furanocoumarin concentrations in fruits and seeds of *Angelica archangelica*. Envir. Exper. Bot. 31:447-452.

**EMBRYOGENESIS FROM ISOLATED MICROSPORES OF *BRASSICA NAPUS***

**TELMER, Cheryl A., NEWCOMB, William and SIMMONDS*, Daina H.**
**Department of Biology, Queen's University, Kingston, Ontario K7L 3N6.**
***Plant Research Centre, Agriculture Canada, Ottawa, Ontario K1A 0C6.**

***Brassica napus* cv. Topas microspores which are isolated, heat treated and cultured, develop into haploid embryos instead of pollen. Only a narrow period in gametophytic development near the first pollen mitosis is susceptible to manipulation. Isolations with high frequencies of embryogenic microspores can be obtained by determining the developmental stage of the microspores at the time of culture. The isolated microspores require a high temperature treatment to form embryos therefore *in vivo* and *in vitro* microspore division was investigated at low and high temperatures to assess cellular changes important for embryogenesis. Samples for studies of cellular morphogenesis were fixed and embedded for light and transmission electron microscopy. *In vivo* microspore development and microspores cultured at 25°C were characterized by an asymmetrical division and a curved cell plate separating the large vegetative cell from the small generative cell. However, 24 h at 32.5°C and a flat cell plate divided the cytoplasm and organelles more equally. Microspores which were cultured for 24 h at 32.5°C, of which a population were embryogenic, divided symmetrically and the cell walls contained electron-dense deposits and vesicle-like structures. Possible mechanisms of induction will be discussed.**

POTTRUFF, C. L. * AND U. POSLUSZNY. Department of Botany, University of Guelph, Guelph, Ontario, Canada N1G 2W1. - Developmental morphology of reproductive structures of *Phyllospadix* (Zosteraceae).

*Phyllospadix* is a marine seagrass in the family Zosteraceae. It is an aquatic monocot that is adapted to surf and anchors to rocky substrates by condensed rhizomes. The flowers of the Zosteraceae are characterized by an inflorescence unit consisting of a flattened spadix with naked flowers on one side, associated with scales and enclosed within a spathe. *Phyllospasdix* is dioecious while the other genera in the family are monoecious. Using techniques of epi-illumination light microscopy and SEM, studies of developmental morphology have been undertaken to examine the complex and unusual reproductive structure of this genus. This developmental data will attempt to: 1) clarify the morphological nature of the reproductive unit (ie. is it a flower or an inflorescence?) and, 2) provide taxonomic information to help in circumscribing the family (Zosteraceae).

KEMP, JAMES R.*, USHER POSLUSZNY, and PETER G. KEVAN. Department of Botany, University of Guelph, Guelph, Ontario, N1G 2W1, Canada. Floral development of *Rosa setigera* (Michaux).

The development of the flower of *Rosa setigera* from initiation to the onset of anthesis is described. *R. setigera* is the only known member of the genus *Rosa* to exhibit dioecy. Furthermore, the flowers of male plants and female plants appear identical; a condition referred to as "cryptic dioecy". Sepals and petals are formed on a meristematic ring and stamens arise in centripetal whorls on the developing hypanthial wall. Gynoecial primordia arise individually on the floral meristem and styles appear to fuse postgenitally as they are exerted through the hypanthial lip. Although historically the hypanthium has been considered as evidence for congenital fusion of sepals and petals, the term "continuity" is applied to the developing hypanthium, thereby avoiding speculation based on a concept which lacks empirical support.

BARABÉ, DENIS, STÉPHANE DAIGLE et LUC BROUILLET. Institut de recherche en biologie végétale, Jardin botanique de Montréal, Québec, H1X 2B2. Sur la croissance allométrique de la feuille des Bégonias.

Dans le cadre d'une étude théorique et expérimentale de l'asymétrie chez les plantes, la feuille des Bégonias soulève des problèmes d'ordre mathématique et biologique. Dans le genre *Begonia*, qui comprend près de 1,000 espèces on trouve des feuilles symétriques et des feuilles asymétriques. D'après D'Arcy Thompson (On Growth and Form),"... the so-called asymmetrical leaf of Begonia,... is seen to be really a case of unequal, and not truly asymmetrical growth on either side of the midrib". Des observations au microscope électronique à balayage ont montré que les feuilles des Bégonias, qu'elles soient symétriques ou asymétriques à la fin de leur développement, se développent à partir d'un primordium asymétrique. Il s'agit d'un cas réel d'asymétrie. D'après Thompson, le rapport entre les deux parties de la feuille suit la relation $AOa' = n\,(AOa')$, où n représente le rapport initial entre les deux parties. Nous avons vérifié cette hypothèse en prenant des mesures sur 20 espèces. Six feuilles par espèce ont été mesurées. Une analyse numérique montre que la relation entre les deux parties de la feuille correspond à la formule $AOa' = n(AOa)^k$, avec $k > 1$ ou $k = 1$. Lorsque $k = 1$, la feuille conserve plus ou moins sa forme initiale durant la croissance. Lorsque $k > 1$, l'asymétrie augmente.

Kampny, C. M.*, T. A. Dickinson, and N. G. Dengler, Department of Botany, University of Toronto, ON M5S 3B2, and Department of Botany, Royal Ontario Museum, Toronto ON M5S 2C6. Bud growth in Veronica longifolia (Scrophulariaceae).

Interest in heterochronic changes in floral evolution has led to the use of organ growth rates as characters in comparative studies. We have measured bud length of greenhouse grown Veronica longifolia in absolute time to test whether growth rates differ between plants and within and between inflorescences of different ages on the same plant, and how organ size correlates with absolute time. Growth rates (slopes of ln transformed measurements plotted against time) did not differ significantly within and between inflorescences, but did so between plants. Since absolute growth rate of floral organs can thus vary within a species, absolute age appears not to be a good indicator of the developmental ages or "stages" necessary for comparative studies. Also, floral development often cannot be followed in absolute time, due to problems in obtaining, growing, or observing live material. Therefore, the use of changing organ configuration (allometry) or relative growth rate using a suitable organ (for example, plotting against gynoecium length) is advocated for studies of comparative floral development.

Vieth J, Laublin G, Morisset C, et Cappadocia M, I.R.B.V., Montréal, Qc, H1X 2B2 - Aspects histologiques de l'embryogenèse somatique indirecte chez Iris à partir d'explantats de racines.

Sommaire d'une étude histologique de l'embryogenèse somatique indirecte à partir de racines, technique mise au point récemment par LAUBLIN et collaborateurs (1991) pour trois espèces d'Iris.

Sur les explantats se développent d'abord des microtubercules à la place de cals ordinaires. Leur initiation rapelle la formation de radicelles: endogène, au niveau du péricycle, en face d'un faisceau ligneux. La partie proximale de l'ébauche est zonée en cortex et cylindre central; la partie distale devient sphérique grâce à une sorte de méristème latéral. Presque entièrement méristématiques, ces tubercules I vont se multiplier durant quelque temps. Transplantés sur un milieu de régénération, des tubercules similaires aux primaires se développent, dont l'intérieur est cependant surtout parenchymateux et dont l'extérieur deviendra finalement plutôt irrégulier. Ces microtubercules ou cals II sont couverts d'un pseudo-parenchyme hétérogène, d'épaisseur assez variable. La plupart des cellules-mères d'embryoïdes se développent au sein du pseudo-parenchyme; des restants de ce tissu insolite accompagnent les embryoïdes jusqu'à la fin de leur différenciation.

Rolf Sattler, Biology Department, McGill University, Montréal, Québec, H3A 1B1. -What is a leaf? Reflections on the conceptual basis of comparative developmental morphology.

'What is it?' appears to be a primary question in any scientific enquiry. When we study the development of any structure, we usually want to know what kind of structure we are trying to understand. Using the leaf as an example, I discuss conceptual issues underlying the definition of any structure. Can we define a leaf monothetically in terms of a set of properties? If not, can we define it polythetically? If this also fails, are injuctions the most appropriate conceptual tool? Injunctions imply fuzziness and are compatible with a continuum view of nature. On this view, instead of asking 'What is it?', we rather ask: 'How is it related?' If this relational view is coupled with a profoundly dynamic approach to plant morphology and development, we arrive at process morphology: form is process; any particular structure is a particular process combination; the diversity of structures is a diversity of process combinations; and structural evolution is the evolution of process combinations. This view of structure and development integrates in a dynamic fashion ontogeny and phylogeny, development and evolution. Since it changes the questions we ask, it gives new directions to research on plant morphology, development, and related disciplines.

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## THE ROLE OF F-ACTIN IN POLLEN DEVELOPMENT OF *BRASSICA NAPUS* CV. TOPAS

**GERVAIS, Carmen[1]*, SIMMONDS, Daina H.[1] and NEWCOMB, William[2].**
**[1]Plant Research Centre, Agriculture Canada, Ottawa, Ontario K1A 0C6.**
**[2]Department of Biology, Queen's University, Kingston, Ontario K7L 3N6.**

**Pollen development was studied in the species *Brassica napus* cv. Topas. Fixed cells were studied using an epifluorescent microscope after labeling microfilaments (MFs) with rhodamine conjugated to phalloidin (rh-ph) and staining DNA with Hoechst 33258. Complex cytoplasmic MFs and nuclear envelope associated MFs are present in uninucleate pollen. As the cells enter mitosis the MFs slowly disappear until at metaphase they are no longer present except for a few fine cytoplasmic strands. They reappear in association with the phragmoplast following anaphase. The organization of cortical and cytoplasmic MFs was followed in binucleate pollen. The possible roles of MFs in cell division will be discussed.**

## The architecture of the extramatrical phase of *Pisolithus* sp. and water relations of *Pinus pinaster* seedlings during water stress.

Lamhamedi M. S. and J. A. Fortin
Institut de Recherche en Biologie Végétale. 4101 est Sherbrooke, Montréal H1X 2B2.

Dikaryotic cultures of *Pisolithus* sp. showed much variation in the architecture of the extramatrical phase (formation of mycelial strands, diameter and extension of mycelial strands). Physiological indicators of *Pinus pinaster* seedlings inoculated with different dikaryons were evaluated during a drought cycle. Dikaryons having extensive and large mycelial strands tolerated drought better and recovered more rapidly from drought than those that produced only fine hyphae. These results indicate that the potential exist to select genotypes of *Pisolithus* for reforestation programs in arid and semi-arid zones.

## LA CULTURE D'OVAIRES D'*Iris* sp.

Laublin, G., Brault, M., Daigle, S. et Cappadocia, M.*
Institut de Recherche en Biologie Végétale
4101 est, rue Sherbrooke, Montréal, Québec H1X 2B2

Dans cette étude nous avons expérimenté la culture *in vitro* de sections d'ovaires, provenant de boutons floraux divisés en deux tailles, d'un hybride interspécifique et de sa progéniture composant les 3 génotypes testés. Plusieurs milieux de culture différents furent utilisés contenant, entre autres, du nitrate d'argent ($AgNO_3$) dans la moitié des cas ainsi que différents régulateurs de croissance en concentrations variées, ceci étant valable autant pour les milieux d'induction que pour les milieux de régénération. Des différences significatives furent notées parmi les génotypes et les milieux d'induction par rapport à l'induction de cals, tandis que la présence de $AgNO_3$ et la taille des explants n'ont pas influencé. Le même scénario se répète pour les résultats obtenus après le transfert sur les milieux de régénération. A titre d'exemple, en moyenne 47% des explants du génotype C, placés sur le milieu 7 avec ou sans $AgNO_3$, ont produit des plantules ce qui constitue notre meilleur rendement. Nous avons aussi obtenu des structures florales sur ces différents milieux, chose qui ne fut jamais observée auparavant. Selon le but visé - obtention favorable de plantules, de "fleurs" ou de cals - la composition du milieu à utiliser peut être choisie à la suite de cette étude. Mais il reste encore du travail à faire pour améliorer davantage les rendements et pour étudier plus à fond les structures florales obtenues.

West, M.M., Lott, J.N.A. and Murray, D.R., Department of Biology, McMaster University, Hamilton, Ontario Canada; University of Sydney, Sydney, Australia, 1992.
Studies of storage reserves in seeds of the marine angiosperm Zostera capricorni.

Transmission electron microscopy and light microscopy were used to study the mature seeds of Zostera capricorni Aschers. The structure of Z. capricorni seeds was determined to be similar to that of Z. marina L. Histochemical stains revealed large quantities of starch in all tissues of the embryo as well as smaller amounts of lipids and proteins. Electron-dense globoid crystals were present in all tissues of the embryo. Energy dispersive x-ray (EDX) analysis of the globoid crystals revealed the presence of varying amounts of P, Mg and K. Small amounts of Ca were also detected in globoid crystals of all tissues of the embryo. Neutron activation analysis results showed elevated contents of Na and Cl in whole seed samples of Z. capricorni. EDX analysis showed varying amounts of these two elements in globoid crystals of the embryo.

Cell structure changes and secondary metabolite extrusion during senescence

Alicja M. Zobel[1], M. Kuras[2], Stewart A. Brown[1], Teresa Tykarska[2] and Ewald Schnug[3] [1]Chemistry Dept., Trent University, Peterborough, ON K9J 7B8; [2]Electron Microscopy, Warsaw University, Poland; [3]Institute for Plant Nutrition and Soil Science, Christian-Albrechts University, D-2300 Kiel, Germany.

Canola seeds (*Brassica napus* L.) of different ages were investigated for their cell structure and germination rates. Seeds were harvested from the same garden in Warsaw from 1979 to 1990. Leakage of sinalpin was measured. Seeds were divided into three distinct groups: 1) germinating very well and not leaking; 2) older ones leaking but still germinating at a lower rate; 3) the oldest ones, leaking the most and not germinating. The leakage was connected with changes in the cytoplasmic structure of the dry seeds and with restoration of endomembrane structure during imbibition. There were visible changes in total glucosinolate concentration, which could be partially due to sinalpin concentrations. Another group of compounds, furanocoumarins, of *Ruta graveolens* leaves exhibited changing concentrations on the surface and within the leaf during senescence. Increased extrusion not followed by increased production during senescence of the cells, and removal from the surface, were the processes responsible for the changes of furanocoumarins in these two compartments. Dead leaves contained up to 2 orders of magnitude less furanocoumarins compared to the active green leaves. Thus, in these two different model systems for senescence, increased extrusion of secondary products, followed by their lowered biosynthesis, were visible, paralelled by changes in cell structure.